

**WIND AND MOUNTAIN CLIMATOLOGY
IN SEVERE ENVIRONMENTS:**

**SIGNIFICANT DISTURBANCE PATTERNS
OF 12-13 NOVEMBER 2011 WIND STORM
IN ROCKY MOUNTAIN NATIONAL PARK**

SELECTED SLIDES

D. E. GLIDDEN

ORIGINAL WIND RESEARCH STUDIES AVAILABLE AT:

<http://www.mountwashington.org/education/readings.php?su=edutrips/&sn=EduTrips>

DISCUSSION

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- **During late May-early June 2012, RMNP Forester Brian Verhulst and I had a detailed look at the November 12-13, 2011 wind storm damage in Rocky Mountain National Park. Brian was able to differentiate the November 12 damage from other events (such as road work, pine beetle cutting activities, and other storms). Gathering data on tree-fall directional azimuths, which appear to have generally reflected a 230-250 degree (SW-WSW) resultant wind vector for the damage (off the Divide) was useful in identifying some of the characteristics of that particular event. I also had a chance earlier to look at some wind damage around Brainard Lake - and met with ARNF silviculturist Kevin Zimlinghaus. Similarly, the damage there indicated a wind direction of around 250 degrees. The influence of man-made open areas in the role of intensifying these events was noted, as was the uniquely different characteristics of the Hidden Valley blowdown in 1973...both in strength and crest-level wind direction.**
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- **The impressive basin-wide damage in Glacier Gorge was noted, and these directional falls also appeared to reflect a downslope WSW-SW component, rather than a north-south topographic channeling influence. Hopefully, we will be able to acquire some aerial photographs of this large disturbance in the future.**
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- **The November 12-13 storm appears to be more typical of a strong Divide wave at the mountain top levels (generally associated with strong Pacific fronts), and which then translated into a downslope component, perhaps accelerated by topographical features like Bierstadt Moraine. Limited nearby Beaver Meadows ROSS wind data indicated gusts to 66 MPH, but due to exposure issues and power failure, true canopy-level and alpine winds are likely significantly underrepresented. (This was evaluated in a separate discussion.) No direct evidence at the surface of convective downbursts was observed for this event.**
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- **Although lots of damage occurred along the Front Range, it is still not the same type of event that I expect to one day re-occur near the Hidden Valley area. During the May 1973 wind storm, the UPPER LEVEL winds were more from the WNW-NW, while Hidden Valley slope winds were more from the SW. I believe that the variations are related to significant pressure differences which are topographically-induced by the great gulf of Hanging Valley and its separation from Hidden Valley – during periods of very high crest-level winds. All of this appears to be critically-dependent on slight changes in crest-level wind direction, and strong changes (rapid rises or falls) in advective pressure systems. The more localized, damaging Hidden Valley wind phenomena may be something different, which results from the unique topographical pressure effects in the area. Post-event field work at the time suggested a more WNW component to airflow crossing the alpine at the time of damage, rather than the SW or WSW flow apparently occurring with the November 12-13 2011 storm.**
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- **The Hidden Valley blowdown – in overall strength, extent, gust factors, and massive crushing – was a more significant event.**



**NEARBY UPROOTED TREE
320 DEGREES INDICATED
WIND DIRECTION**

310 DEGREES

**PONDEROSA
FALL RIVER BASIN WIND DAMAGE
300-320 DEGREES
DATE OF DAMAGE UNKNOWN;
SUSPECTED TO BE A DIFFERENT
SPRING 2012 STORM
D. E. GLIDDEN**

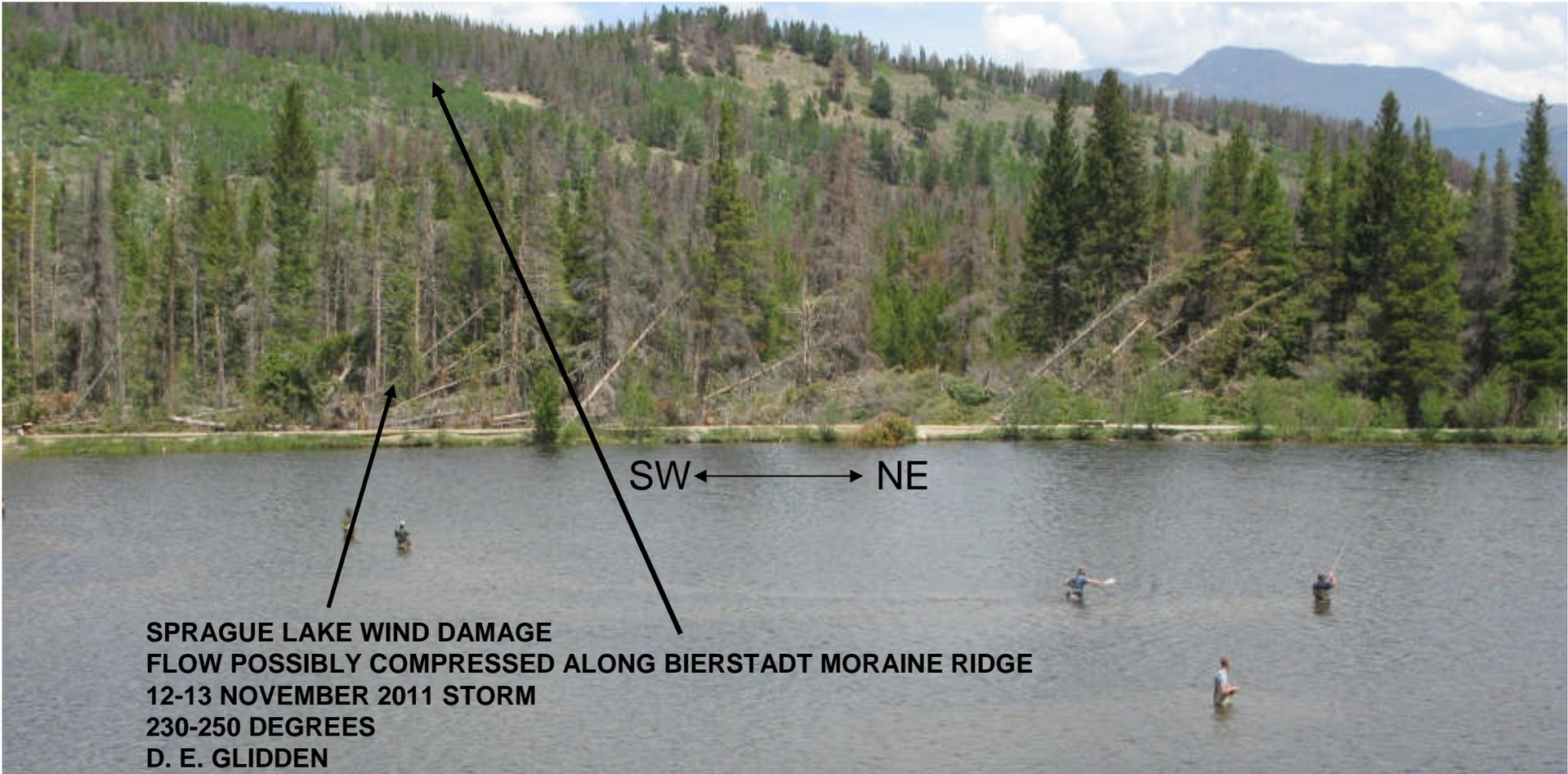
**TUXEDO PARK WIND DAMAGE
12-13 NOVEMBER 2011 STORM
230-250 DEGREES
BRIAN VERHULST, RMNP FORESTER,
POSING FOR SCALE**



**NEARBY UPROOTED TREE
230 DEGREES INDICATED
WIND DIRECTION**



D. E. GLIDDEN



**SPRAGUE LAKE WIND DAMAGE
FLOW POSSIBLY COMPRESSED ALONG BIERSTADT MORaine RIDGE
12-13 NOVEMBER 2011 STORM
230-250 DEGREES
D. E. GLIDDEN**



**NEARBY FRACTURED TREE
230 DEGREES INDICATED
WIND DIRECTION**



**BRIAN VERHULST,
RMNP FORESTER**



**SPRAGUE LAKE WIND DAMAGE
12-13 NOVEMBER 2011 STORM
230-250 DEGREES
D. E. GLIDDEN**

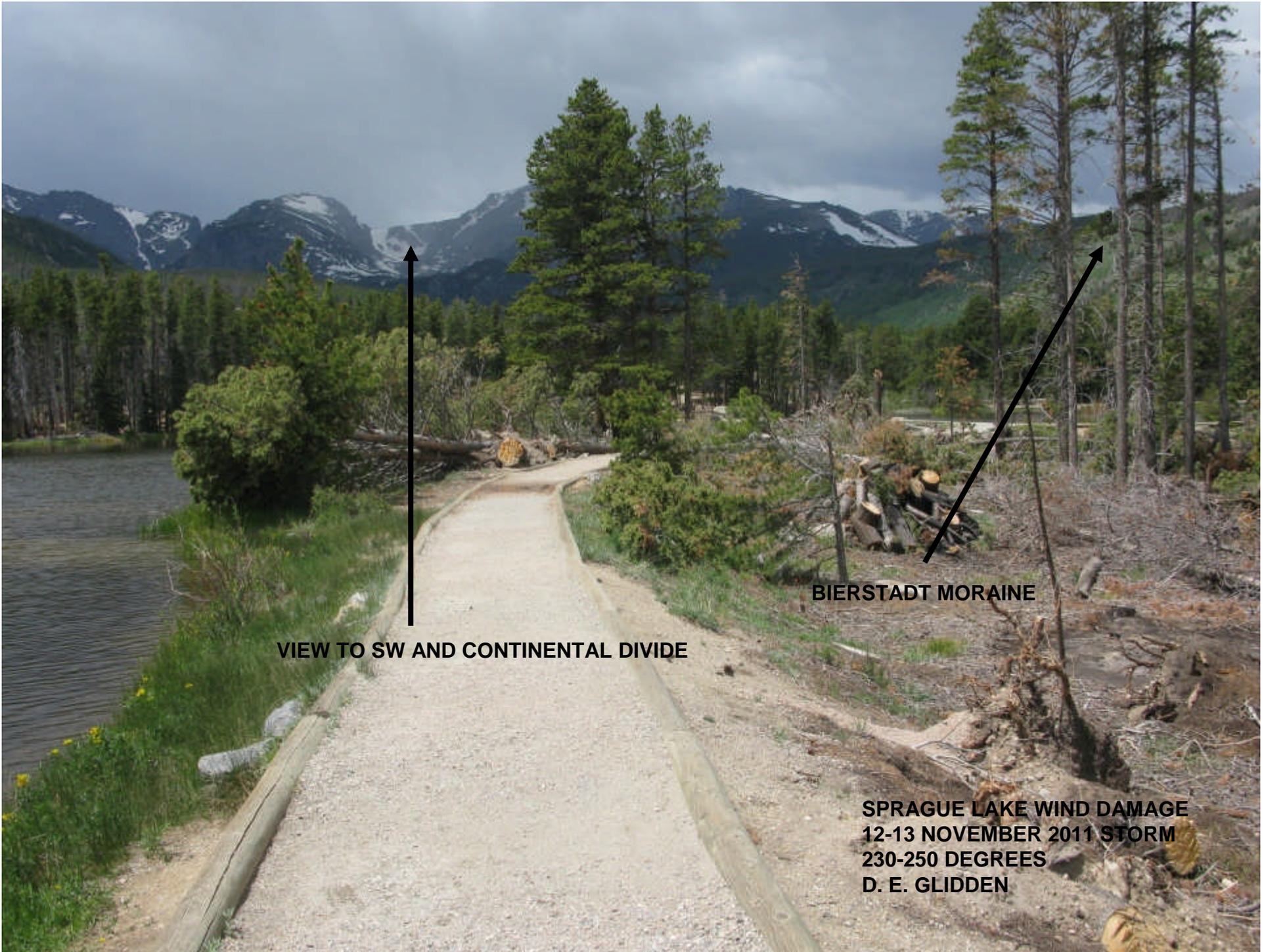




**SPRAGUE LAKE WIND DAMAGE
12-13 NOVEMBER 2011 STORM
230-250 DEGREES
D. E. GLIDDEN**



**SPRAGUE LAKE WIND DAMAGE
12-13 NOVEMBER 2011 STORM
230-250 DEGREES
D. E. GLIDDEN**



VIEW TO SW AND CONTINENTAL DIVIDE

BIERSTADT MORaine

**SPRAGUE LAKE WIND DAMAGE
12-13 NOVEMBER 2011 STORM
230-250 DEGREES
D. E. GLIDDEN**



**BRAINARD LAKE WIND DAMAGE
12-13 NOVEMBER 2011 STORM
250 DEGREES
UPROOTED TREES, MANY IN
DEVELOPED AREAS
D. E. GLIDDEN**



THE CREST-LEVEL WIND DIRECTION FOR NOVEMBER 12-13, 2011 WIND STORM APPEARS TO BE SW-WSW, BASED ON MORE SOUTHERLY RAWS STATIONS OUTSIDE RMNP.

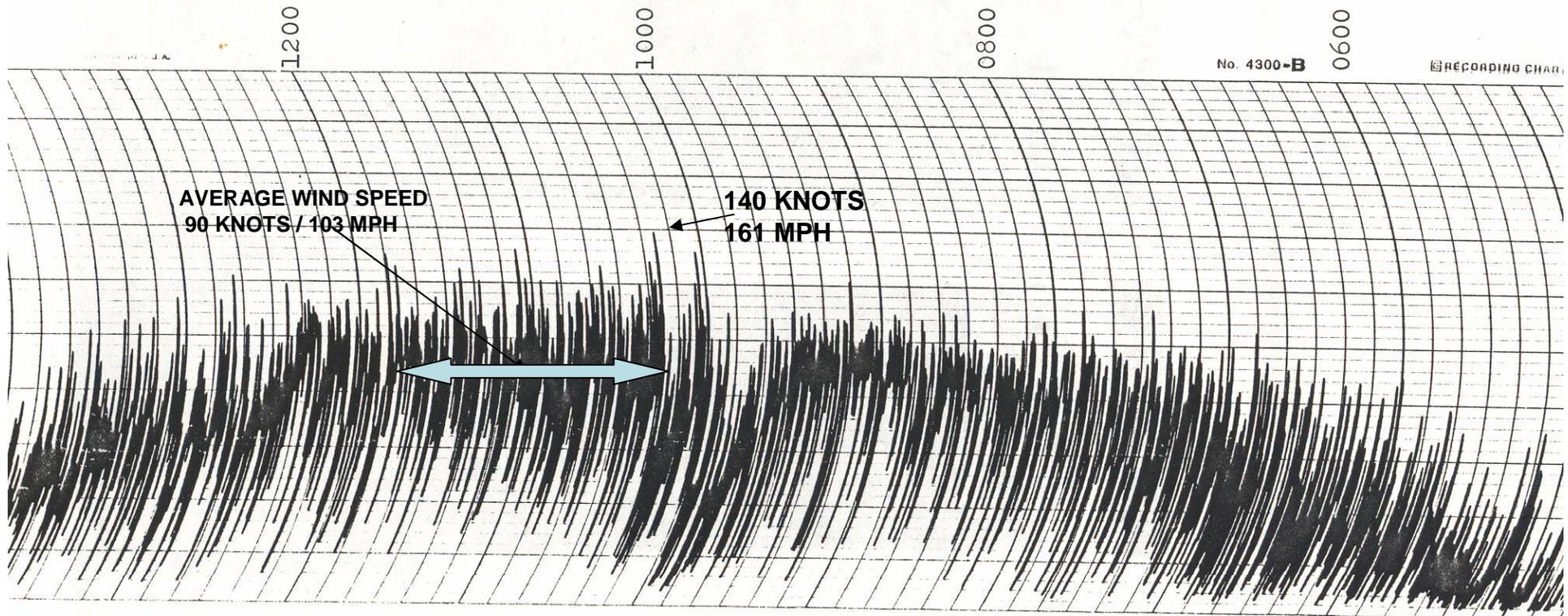
LONGS PEAK SUMMIT ON JANUARY 24, 1981

MAXIMUM RECORDED PEAK GUST = 161 MPH

MAXIMUM 5-MINUTE AVERAGE = 114 MPH

MAXIMUM 1-HOUR AVERAGE = 101 MPH

MAXIMUM PEAK GUST RECORDED FOR WINTER 1980-81= 201 MPH



After D. E. Glidden, *Winter Wind Studies in Rocky Mountain National Park, 1982*

FIG. 14

Anemograph of severe winter storm on Longs Peak, January 24, 1981. Scale: 0-200 knots (uncorrected). Note the extreme range of turbulence.